DOWN TO EARTH

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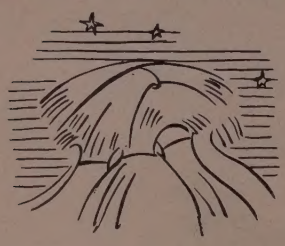
ETHYLENE DIBROMIDE



as a grain mill machinery fumigant

Grain Gains Importance

THE GRAIN the nation has in storage at one time is always a major source of real wealth. Today, in light of the critical world food situation every last kernel has gained a new importance. Storages are low, and they will probably continue to be low for another year or two. In the meantime, it is obviously necessary that the small existing reserves and our seed supplies be given every possible protection. Sanitation should start on the farm and continue through the processing of the grain.

Infestation Outlook

For many years insect infestation in granaries and mills was accepted as a necessary evil. Progressive millers knew better and have done their best to produce flour free from adulteration; and the officials of the Pure Food and Drug Administration have insisted on preventative measures to rid the industry of infestation.

Probably two of the primary problems in keeping both grain storages and mill machinery free from insects are the absence of a long range preventative program to combat reinfestation—and the lack of economical, efficient fumigants to do the job.

A New Chemical

In recent years there have appeared many improved fumigants to make the fumigation job increasingly easier and more efficient. Dowfume 75 is among them. In the last two years there has appeared a new chemical, ethylene dibromide, which added to existing products such as Dowfume 75, allows dosages to be lowered and still produces superior results.

Ethylene dibromide is the same chemical discussed in the last issue of Down to Earth as a soil fumigant. Recent research has indicated that it will have many other important uses. Its future as a grain and a mill machinery fumigant promises to be among them.

The Pests

In stored grain and grain products the granary weevil and the rice weevil are perhaps the most destructive grain insects in the world. They frequently cause complete destruction of grain in elevators or in farm bins. Mealworms, Cadelle, the Confused Flour Beetle, the Red Flour Beetle are among the other more destructive pests present where grain products are stored.

Flour mill machinery may become severely infested with the Confused Flour Beetle or "Bran Bug", as the pest is popularly known. The Saw-Toothed Grain Beetle and the Mediterranean Flour Moth along with other insects are common pests in mill machinery. When the latter pest is present, it is a relatively sure sign that fumigations are too infrequent or ineffective.

These and related pests are responsible for a tremendous annual loss in stored grain and grain products. Fumigation plus continued vigilance in eliminating breeding places that permit reinfestation now make it possible to eliminate contamination from the grain storage and milling establishments.

Product Research

Research work with ethylene dibromide was reported as early as 1925 and further work by different workers in the ensuing years established minimum lethal dosages for various pests. Meantime, the cost of the product fell to approximately one-third of its 1925 cost, opening the way for research for large-scale application.

Laboratory grain fumigation tests conducted several years ago indicated that the product in combination with a chlorinated hydrocarbon carrier produced an outstanding surface kill. Furthermore, its penetrating ability was proven.

In the last two years extensive field tests have been conducted at Hutchinson, Kansas. Several types of farm grain bins were used. Laboratory test results were corroborated by these field experiments. Dosages were determined for the steel "ever normal" granary and other farm bins.

Wheat samples, both treated and untreated, were sent to the Department of Milling Industry at Kansas State College for milling and baking tests. There were no adverse effects from the fumigant on either the milling or baking properties of the wheat.

Germination tests have been conducted in the laboratory and show that ethylene dibromide treatment does not appreciably lower the germination of wheat.

DOWN TO EARTH • A Review of Agricultural Chemical Progress, Published by THE DOW CHEMICAL COMPANY, Midland, Michigan, manufacturers of agricultural chemicals. Thirteen thousand copies distributed to those engaged in agricultural research in the United States and Canada. • Eugene Perrin, Editor.

IN THIS ISSUE • *Ethylene Dibromide as a grain mill machinery fumigant.* • *DN-111 used with DDT controls Red Mite* • *New Soil Fumigant meets pineapple grower's needs* • *Selective Weed Killer found useful for peas.*

ON THE COVER • *The Centennial Flouring Mills Co. new 1500 barrel mill in Spokane, Washington.*

Directions For Use

In Farm Granaries: Early September is the ideal time for treating grain in farm bins. Pests, if they are present, are beginning to multiply rapidly. Treatment in the fall will give good protection until the following summer.

For treatment of grain in good, tight, well-constructed bins, it is recommended that ethylene dibromide (Dowfume EB-10) be applied at the rate of 2 gallons per 1,000 bushels. Grain in loosely constructed bins may require a dosage of from 3 to 4 gallons per 1,000 bushels.

The grain surface should be leveled before treatment and the fumigant should be applied as evenly as possible over the entire surface of the grain. The fumigant may be applied from outside by spraying through a length of 1/8 inch pipe without nozzle. Small amounts of grain can be treated with a sprinkling can. Treated grain bins should be closed up as tightly as possible for a minimum exposure period of approximately one week.

In Large Elevators: Grain in large terminal elevators may be treated at practically any time of the year except during the cold winter months.

Dowfume EB-5 has been designed for large elevators and should be applied at the rate of 1.5 gallons per 1,000 bushels except for the bottom and top thousand bushels; here double the recommended dosage should be applied.

The usual procedure is to apply the fumigant to the grain as it is being turned from one bin to another. In the transfer of the fumigant from the drum at the time of application a sack placed on the floor under the fumigant drum is desirable to catch any spillage. When the sack is saturated it is recommended that it be discarded, as a safety measure. When the bin is filled, its surface should be treated in the same manner as farm bins. The minimum exposure period is again one week, although a longer period is desirable.

Mill Machinery Fumigation: Ethylene dibromide (Dowfume EB-15), when properly applied at monthly intervals, offers an economical method for controlling all types of stored product pests in flour mills and many other food manufacturing plants. It is exceptionally efficacious for the treatment of processing machines capable of retaining fumigant vapors for reasonable lengths of time. Dowfume EB-15 serves as a supplemental control measure to general space fumigation with methyl bromide.

Very little preparation is necessary for the application of Dowfume EB-15 in mills. The stockings on all sifters should be tied off and the bottoms of the pack-out packer bins should be sealed by tying one-third of a bag of flour up on the tubes. The mill should be run dry previous to treatment. The only equipment needed are number of graduated 32 oz. prescription bottles and a few wire baskets similar to those used for carrying milk bottles. The correct dosage for each unit of machinery are shown in the table *Dosage Recommendations.*

Since accumulation in sifters are located in "dead" outlets of the sifter box or between the stock of sieves and the box "walls", little can be accomplished by application of a fumigant into the section inlet. It is recommended that sifters be fumigated during repairs of the sifter sieves.

After the sieve cloths have been repaired and prior to their replacement, not less than 8 ounces of Dowfume EB-15 should be poured into each "dead" outlet. The sieves and doors should then be replaced. This method will prevent insects from breeding in accumulations always present in such "dead" outlets.

When transferring the chemical from drums to bottles, the worker should be in a well-ventilated space and avoid spillage insofar as is possible. A gunny sack placed on the floor under the faucet will absorb spillage and can be disposed of when saturated. It is advisable for the person filling bottles to wear a gas mask with a black cannister suitable for absorbing organic vapors.

If possible it is desirable to fill these bottles where good

Wooden type Ever-normal granaries.

DOSAGE RECOMMENDATIONS

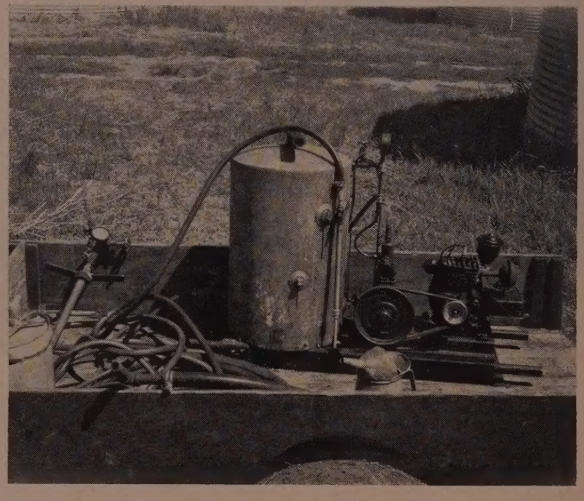
It is recommended that Dowfume EB-15 be applied to machinery mills at monthly intervals as indicated in the following dosage table:

MACHINERY UNIT	APPLICATION POINT	DOSAGE IN FLUID OUNCE
Elevator boots	Through hole drilled in boot	12 to 16′
Reel and purifier conveyors	Pour along entire length	10 to 16′
Conveyors		
(a) 6″ to 8″ conveyors	At convenient points over entire length	1 to 1.5 per linear ft. but not less than 8 per conveyor
(b) 10″, 12″ and 16″ conveyors	At convenient points over entire length	2 to 3 per linear ft. but not less than 16 per conveyor
Bins (when empty)		
(a) Less than 500 cu. ft. capacity	Splash around inside of bin near top	48 per bin
(b) More than 500 cu. ft.	Splash around inside of bin near top	48 per 500 cu. ft.
Dust trunks		16 per trunk
Bran and shorts dusters	Hand hole at top or any opening	12 to 16
Spouts	Into convenient hand slides	2 (for Mediterranean flour moth only)
Rolls (In each side)	Into spouts above	6 (for Mediterranean flour moth only
Elevator heads	Pour around inside	10 (for Mediterranean flour moth only)

ventilation is available such as that afforded on a freight elevator where there are always air currents up and down the shaft. The filling of the bottles on the elevator also speeds up and makes for easier application. It is suggested that filling operations start at the top floor and proceed downward.

When the mill has been treated, all doors or other means of entrance should be locked. Warning signs should be placed on all points of entrance and a watchman should guard the premises. The recommended exposure period after treatment is 24 hours after which time doors and windows should be opened; cross-ventilation is particularly desirable. Workmen should be allowed to enter the building only after all traces of odor from the fumigant have disappeared. Ventilation is usually accomplished in from 2 to 4 hours. The temperature in the mill should be carefully watched, especially during cold weather.

This research worker is applying Dowfume EB-10 to the surface of the wheat in this granary.



Application equipment used in applying Dowfumes in the Kansas tests.

SUMMARY

Advantages of Dowfume EB-15

1. Highly toxic to all mill insect pests.
2. Does not affect the baking qualities of flour.
3. Leaves no odor, color, or other objectionable residues in food products and machines.
4. Noninflammable.
5. Not objectionable to handle.
6. Has a warning odor.
7. Economical.
8. Easy to apply.
9. Can be used safely by the operator if reasonable precautions are observed.

Advantages of Dowfume EB-5 and EB-10

1. Effective against all types of stored grain pests in all kinds of grain.
2. Especially effective in the surface layer of stored grain.
3. Penetrates well, giving excellent control of pests even down to the bottom of the bin.
4. Can be used effectively in all types of storage bins.
5. Does not impair the germinating qualities of grain.
6. Does not adversely affect the baking qualities of flour prepared from treated grain.
7. Not disagreeable to handle.
8. No residual odor or taste effects.
9. Noninflammable.
10. Nonexplosive.
11. Economical.

Dowfume EB-10 serves to give protection on the farm and Dowfume EB-5 and EB-15 carry control to the mill and elevator. The latter products supplement methyl bromide general space fumigation.

DN-111 *used with* DDT *Controls Red Mite*

DDT is bringing to growers the long sought answer for codling Moth Control, but the European Red Mite populations build up following DDT treatment. 1945 tests show good control by adding DN-111 to sprays.

THE RED SPIDER MITE is a most destructive pest being injurious to apple, plum, and prune orchards in the midwest and east and highly destructive in citrus areas. During the past year, research workers were tremendously interested in the superb control over codling moth offered by DDT. The letdown came when it was discovered that mite populations tended to build up following application. The red mite problem became much more acute on DDT treated trees than on similar trees treated with other insecticides for codling moth control.

Two major factors appear to contribute to this condition as follows: (1) The continued use of DDT destroys most of the important parasites and predators of the red mite, while at the same time it is not toxic to the mites themselves in the amounts required to control codling moth, leaf hoppers and certain other apple pests. Thus the natural biological check against the red mite is largely eliminated. (2) DDT used alone or with lead arsenate prevents much injury from both chewing and sucking insects, and when used alone arsenical injury to the foliage is naturally eliminated. This results in large healthy leaves which afford attractive conditions for rapid development of mite populations. The inevitable consequence of these large numbers of mites is severe injury to leaf chlorophyl exhibited as bronzed foliage, fruit of poor size, color, and quality, and extensive premature drop of fruit and foliage.

Destructive mite populations develop much earlier in the season following the use of DDT than when arsenate of lead and/or nicotine and phenothiazine are used. This is emphasized in the above table, assembled from results obtained by an experiment in a Jonathan orchard during the summer of 1945.

TREATMENTS 1st and later covers were applied on the following dates: May 28, June 11, 21, July 2, 11, 20, 30, Aug. 8, 20.	Mites per 100 leaves July 31	Aug. 20	Aug. 30	Sept. 7
Lead arsenate all covers	46	246	606	913
Lead arsenate 1st, 5th, 6th, 7th, 9th plus fixed nicotine 2nd, 3rd, 4th, 8th	58	366	1176	1750
Lead arsenate 1st, 5th, 6th, 7th, 9th plus phenothiazine 2nd, 3rd, 4th, 8th	62	652	1100	2870
Lead arsenate 1st DDT alone All other covers	456	4320	3080	4760

This relationship of increased red mite development and the use of DDT need not, and should not, preclude the use of DDT against codling moth, leaf hoppers and other fruit tree pests. Rather it will be expedient to make better use of means for mite control now available (such as di nitro ortho cyclo hexyl phenol) than has often been done in the past. In future seasons a more general and more thorough use of dormant or early season oil sprays is certainly to be encouraged. Such treatments should consist of, (1) use during the spring dormant period of an oil-dinitro spray such as Dowspray Dormant or an oil emulsion

to which the dinitro material is added separately for control of red mite, aphids, and scale insects, or (2) where aphids are not a problem, oil may be used alone during the spring dormant and through the early delayed dormant periods. Special problems such as bud moth and severe oystershell scale may require special attention. While such early treatments with oil emulsion often do not give full season protection against the red mite, they do so delay the period of attack that summer treatments can be employed with safety, with good results, and at a reasonable cost.

During the past two years (1944 and 1945) sprays containing both DDT and DN-111 have been tested extensively on several apple varieties with good results on mite control. Typical examples of mite populations on trees sprayed with (1) DDT alone in all covers and (2) DDT in all but with DN-111 in 3 covers are shown here. The last spray containing DN-111 was applied on Aug. 20.

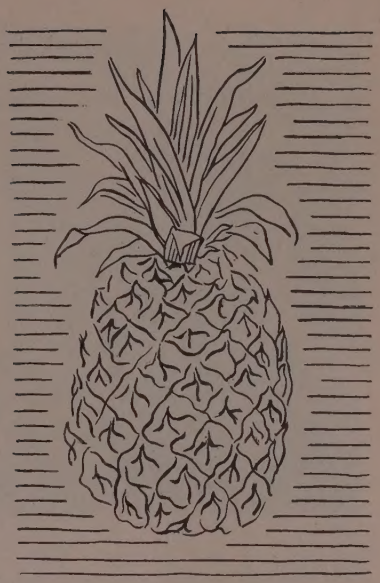
	MITES PER 100 LEAVES	
Count Dates	DDT alone	DDT plus DN-111
July 31	120	8
Aug. 20	1110	40
Aug. 30	973	66

In Southwestern Michigan, DN-111 was used with DDT at various times from 3 weeks after petalfall until late August. These sprays were applied to McIntosh, Jonathan, Baldwin, Delicious, Wealthy, and Golden Delicious with no harmful effects to fruit or foliage. However, one case of premature leaf and fruit drop on Jonathan has been reported following the use of DN-111 and DDT and for that reason the combination should be used with caution on this variety until its safety is more fully determined in the various areas where Jonathan are grown. Of course, in all instances the usual precautions for the use of any insecticide are urged.

A brief account of the early history of the red mite in the United States and Canada and its important relationship to fruit production in recent years is contained in Down to Earth, Volume 1, No. 1. May, 1945. In this account also is a discussion of how certain dinitro compounds were developed which are used extensively to control foliage infestations of the mite by special treatments and by including the dinitro compound in the regular lead arsenate sprays for codling moth control.

New Soil Fumigant

Meets Pineapple Grower's Needs



IN THE LAST few decades many new soil fumigants have appeared to control wireworm, nematode, and various soil pests responsible for tremendous crop losses in many areas. Ethylene dibromide, for example, in 1945 field tests on the West Coast showed outstanding promise (see March issue, "Down to Earth"). This product which controls both wireworm and nematode will be used on many crops and in many varying types of soils.

In 1942 pineapple growers of the Hawaiian Islands began using a new product, a dichlorpropene-dichlorpropane mixture, on a large scale. Much of the research work was done by Walter Carter of the Pineapple Research Institute of Hawaii at the University of Hawaii. The fumigant was so highly successful in initial research applications to pineapple soils that the demand for the product exceeded the supply until recently. It now appears that there are going to be many other areas and crops on which the chemical can be effectively and economically applied in this country, although the consumption of the product to date has largely been in Hawaii.

The dichlorpropene-dichlorpropane mixtures are being used on nearly all pineapple land to be planted in 1946 in Hawaii. The fumigant is even applied on relatively nematode-free land to prevent future infestation. It has been demonstrated to pineapple growers that the crop insurance obtained in this manner more than compensates for the cost of the fumigant. Besides offering nematode control, it has been definitely shown that the initial plant response on fumigated land gives the pineapple the strength to withstand the later ravages of insects, weather and draught.

CARTER'S WORK[1]

In 1943 experiments with root-knot nematodes, the dichlorpropene-dichlorpropane mixture showed a high nematocidal value. An emulsion of diesel oil and the chemical was introduced in irrigation water by furrows at the rate of 200 pounds of the mixture per acre. Furrows were dammed at one end to hold the water. The steepness of the furrow is, of course, an important factor in obtaining an even distribution of the fumigant. In 1944 the director of Hawaiian Agricultural Experiment Station reported favorable yield from this experiment.

Carter points out that for the average grower the application with a disc plow prior to planting the bed would probably be the most practical method of fumigation. In pineapple experiments Carter found a practical solution to the application problem as follows: "By means of a simple device consisting of a small pump geared to the plow wheel, a thin stream of the mixture was dropped at the bottom of the furrow ahead of the plow disc. The plow cut was approximately 12″ wide and the application was made on the last plowing in very dry and friable soil. The first response to this application was unexpected and showed as a material reduction in weed growth in the treated areas. Figure 1 shows the difference in weed growth, particularly Richardia scabra, in the treated and check areas. Plant growth response up to six months after treatment is shown in figure 2 and compares favorably with that obtained with similar dosages of the same material applied with a hand injector".

Carter points out that the fumigant showed high toxicity against the rice weevil and that the usefulness of the material as an insecticide is worth investigation.

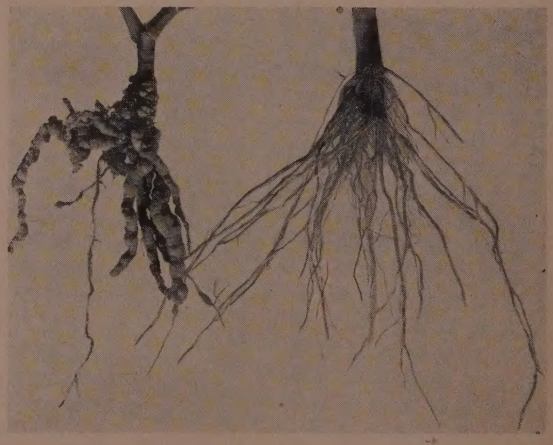
OTHER USES

The California Agricultural Experiment Station, Davis, California, has been conducting field tests in which this chemical was used since 1943. Ethylene dibromide was included in 1944 and 1945 tests. Comparison of the two

[1] "Soil Treatments with Special Reference to Fumigation with D-D Mixture", Walter Carter, Pineapple Research Institute, Honolulu, Hawaii, Journal of Economic Entomology, Volume 38, Number 1, February, 1945.

Fig. 1—Difference in weed growth following treatment with D-D mixture at the rate of 200 lbs. per acre ploughed in prior to planting. Above: Treated. Below: Check.

Fig. 2—Response 6 months after treatment with 200 lbs. of D-D mixture per acre ploughed in prior to planting. Left: Treated. Right: Check.



Roots from tomato plants. The one on the right was grown in soil treated with crude D-D mixture at the rate of 200 lbs. per acre without soil cover; the one on the left was from an untreated plot.

fumigants was reported in the December, 1945, issue of the Journal of Economic Entomology[2].

This report indicated that both fumigants offer excellent possibilities for the economical control of wireworms when properly applied. With dichlorpropene-dichlorpropane a dosage of 40 gallons (400 lb.) per acre gave a satisfactory reduction in pest populations and increased yields of lettuce and beans. The application of the mixture with anhydrous ammonia gave the greatest increases in yields of lettuce the following spring. Ethylene dibromide (Dowfume W-10) at 30 and 40 gallons also gave good kill of wireworms and increased stands and yields.

It is apparent that both ethylene dibromide and dichlorpropene-dichlorpropane mixtures will together offer a broad range of protection to virtually all growers where land is infested. Both products are today being tested extensively in the South and the East. The value of one product may exceed the other under certain soil and climatic conditions and with certain crops. Research work and more extensive tests under local conditions in the next year or two will indicate the product which may be most economically and successfully applied to particular areas. Together the two fumigants should be responsible for tremendous increases in yields in infested land everywhere.

[2] "Ethylene Dibromide and Dichlorpropene-Dichlorpropane Mixture for Wireworm Control", W. H. Lange, Jr., California Agricultural Experiment Station, Davis, Journal of Economic Entomology, Volume 38, Number 6, December, 1945.

Response to soil fumigation with D-D mixture. Plants in foreground typical of those growing in untreated soil in the area. Plants in background growing in soil treated with D-D mixture at the rate of 150 lb. per acre. Photographed in the fall of 1942, two years after treatment.

SELECTIVE WEED KILLER FOUND USEFUL FOR PEAS

DINITRO SPRAYS, such as Dow Selective Weed Killer, which have been widely used for the chemical weeding of grain and flax may also be used on canning peas according to experiments recently reported by Michigan State College.[1] When the proper concentrations and dosages are used, many noxious weeds growing in drilled peas are killed or stunted without damaging the crop. The same spray may be used successfully on row-planted market and home garden peas. Peas, flax, small grains and certain other crops have a greater tolerance than weeds to this spray probably because of the waxy nature of their foliage.

Based on two years of testing in Michigan and Wisconsin a concentration of three pints of Dow Selective Weed Killer per 100 gallons of water is recommended for spraying peas.

State experiment station and Dow field research workers on the West Coast have found this same concentration to be satisfactory for that section. To be most effective this spray should be applied during warm bright weather when the temperature is between 65° and 85°. If spraying must be done when the temperature is near 65° or below the concentration may be increased to 4 pints per 100 gallons, and on very warm days it may be reduced to two pints. Between 80 and 100 gallons per acre are recommended as a suitable dosage.

The toxicant in Dow Selective Weed Killer is the ammonium salt of dinitro ortho secondary butyl phenol which has been found to be the most phytotoxic of a long series of related compounds.[2]

In applying Dow Selective Weed Killer it is very essential to use a coarse spray in order to avoid wetting and thus damaging the crop. A fine mist will wet the foliage of peas, flax and grain but larger droplets tend to run off their waxy leaves and stems. Many weed pests are easily wet by a coarse spray and thus killed or stunted.

A relatively low pressure not to exceed 125 pounds and special fan nozzles have been found to be most satisfactory for this type of spraying. In the Red River Valley of North Dakota a rig commonly used carries a 450 gallon tank and a wide boom carrying Monarch No. 78[3] or similar nozzles. A rotary pump operating at 40 or 50 pounds pressure has proved satisfactory. A large capacity pump with suitable nozzles will permit spraying at a relatively high speed. Others have used Monarch No. 59 or similar nozzles and somewhat higher pressures. The important consideration is to get a fairly coarse spray that will give a minimum of wetting of crop foliage. This is governed by the type of nozzle, orifice size, and pressure.

Peas usually show a few "burned" spots on their lower leaves after spraying. The experiments reported by Michigan State College showed that this slight injury does not affect the yield. Stronger concentrations than recommended might adversely affect yield and directions should be followed carefully. The degree to which spraying will improve yield depends on the extent of the weed population which is killed or stunted and which would otherwise compete with the crop. In addition to a possible beneficial effect on yield the elimination of weed vegetation speeds up cutting, loading, hauling, and vining. Frequently the weeds present in the ensilage detract from its value.

Although the dinitro compounds, if taken in appreciable quantity, are toxic to animals there is no risk involved in feeding ensilage from sprayed peas. The insignificant amount adhering to the small vines decomposes readily or is washed off by rain. Spray operators should avoid breathing spray mist by wearing a mask when necessary. Prolonged exposure to the skin should also be avoided. These compounds are yellow dyes which stain the skin and it is advisable to wear oil-resistant type rubber gloves when mixing.

Common wild mustard and some of its relatives such as

[1] The Control of Weeds in Canning Peas with Chemical Sprays, by Keith C. Barrons and Bauford H. Grigsby. Quarterly Bulletin, Michigan Agricultural Experiment Station, Vol. 28, Nov., 1945.

[2] A New Herbicide, 2,4 Dinitro 6 Secondary Butyl Phenol. A. S. Crafts Science, 10:417-418, April 20, 1945.

[3] Made by the Monarch Manufacturing Works, Inc., Philadelphia 34, Pa. Similar fan-shaped weed sprays are available from other manufacturers.

shepherd's purse, wild radish, and French or fan weed are readily killed by Dow Selective Weed Killer. Among other common weeds growing in peas in the North Central States lambs quarters and ragweed are predominate. Both are more difficult to kill than the mustard group but their defoliation by a dinitro spray is sufficient to greatly reduce their competitive effect. Canada Thistle which causes much trouble to canners, because its buds are difficult to separate after vining, is not killed by this spray but its growth may be somewhat retarded. When spray applications are made on warm days the stunting effect on thistle is often enough to eliminate the bud separation problem. This material has no eradicative effect on thistle, however, and now that 2,4-D is available canners should encourage their growers to spot-spray this perennial weed growing in peas. Because 2,4-D injures peas, over-all spraying cannot be practiced with safety. Thistles in grass pastures or land that is not being cropped at the time can be treated with 2,4-D with no harmful effect to the grass or the soil. This new chemical destroys the roots as well as the tops of thistle and other broad leaved perennials; however, more than one application may be necessary for eradication.

Peas should be treated when they are from 4″ to 8″ tall but never after the flower buds are well formed. Dow Selective Weed Killer may be used with all varieties of peas grown for seed, canning or market. It is not recommended for cowpeas grown in the South and West. Austrian winter peas and Scotch peas grown for their dry seed have been sprayed successfully.

Spraying should not be done when the foliage is wet with dew or rain and the surface of the ground should be dry. It is best to avoid spraying immediately following a long cloudy period during which rapid growth has taken place. Apparently sunshine promotes the development of leaf wax which protects the crop from the selective spray.

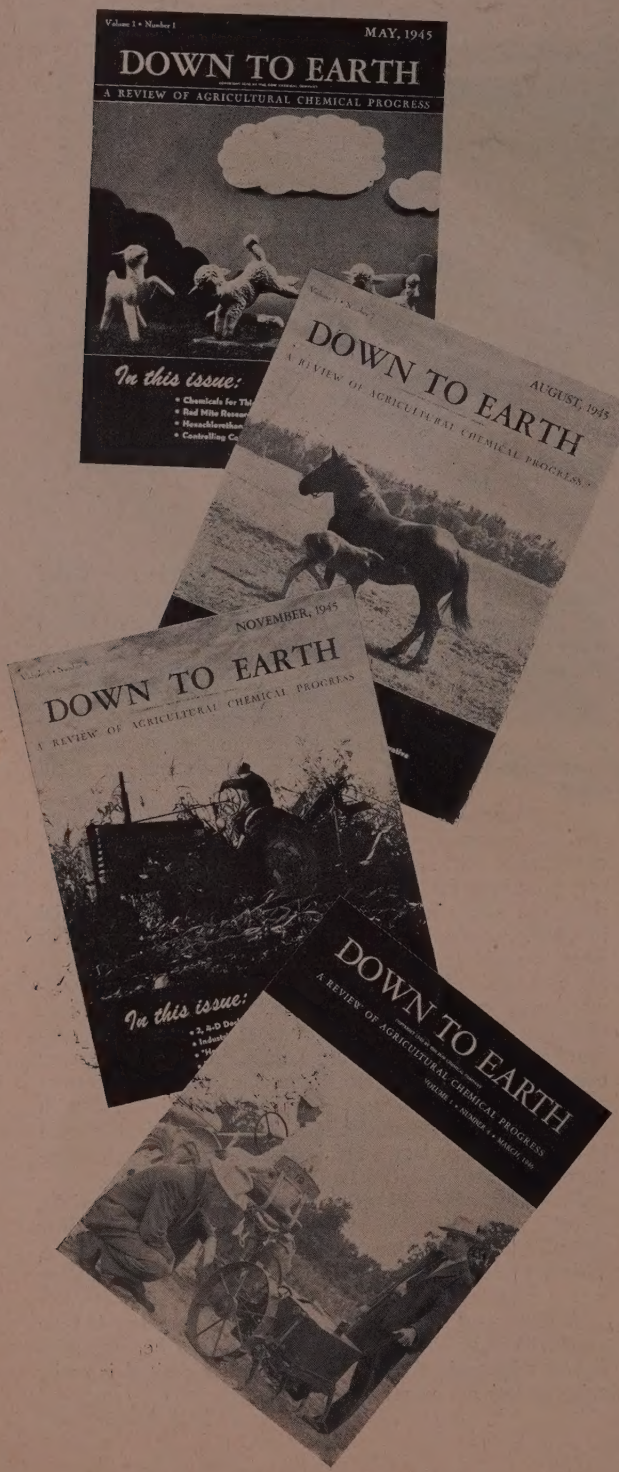
For the chemical weeding of flax, Dow Selective Weed Killer should be applied at a concentration of three pints per 100 gallons. Grains are somewhat more tolerant of the spray and four pints per 100 gallons may be used if in the first application the weeds present are not killed by a lower concentration. The effectiveness of the spray can usually be determined within two days. For all crops 80 to 100 gallons per acre seems to be suitable dosage. Some operators prefer to increase the dosage in order to handle difficult-to-kill weeds.

A number of other crops with waxy foliage have been sprayed successfully with Dow Selective Weed Killer, transplanted and set-grown onions for example. It is also very promising for direct seeded onions when sprayed in the three leaf stage; however, this is suggested only for trial in 1946. Some injury to direct seeded onions may result when a rapid growth in cloudy weather takes place just before spraying. Sweet Spanish onions seem to be somewhat more subject to injury than the globe type. Three pints per 100 gallons is suggested as the maximum concentration for onions. Young alfalfa growing in peas or oats has been sprayed successfully. This practice is recommended especially where a new seeding is infested with mustard and other annual weeds. The alfalfa plants should have five or more leaves before treatment and a concentration of 3 pints per 100 gallons should be used.

If treated when the growth is still short and straight, gladiolus may be sprayed with Dow Selective Weed Killer at 3 pints per 100 gallons without injury of any significance. This practice is especially valuable when one is producing a crop from "bulblets" or cormels.

A recently discovered method of compounding is now employed in making Dow Selective Weed Killer. No mixing or stirring is necessary; and quantity desired is easily poured from the containers.

JUST IN CASE . . . you have missed an issue of Down to Earth containing an article in your field of interest, here is a list of the articles which have appeared to date. Back copies may be obtained by writing Editor, Down to Earth, The Dow Chemical Company, Midland, Michigan.



May, 1945

Chemicals for Thinning Apples
Hexachlorethane for the Control of Liver Fluke in Cattle
New Product Speeds Soil Fumigation
Red Mite Research and the Dinitros
Weed Killers Need Extensive Testing
New Growth Substances Induce Roots on Cuttings
Controlling Corn Ear Worm
Phenothiazine for Codling Moth Control
Detached Fruit Ripening with 2,4-Dichlorophenoxyacetic Acid

August, 1945

Pentachlorphenol—An Ideal Wood Preservative
Hormone Spray Increases Set of Snap Beans
Insect Repellent Research
Potato Vine-Killers
New Remedy for Fleece Worms
Controlling Rodents In Apple Cold Storages

November, 1945

Industrial Outlets for Agricultural Surpluses
2,4-D Declares War on Weeds
Controlling Hibernating Codling Moth Larvae in Apple Containers
The DDT Avalanche
"Hormones" Increase Tomato Production
Tetrachlorethane and Ethylene Dibromide as Rodenticides

March, 1946

War Against the Wireworm
2,4-D Holds Spotlight at Weed Control Conference
Methyl Bromide in the Dairy Industry
Magnesium in the Apple Orchard